

## REMARKS

This is a response to the Office Action mailed on November 21, 2007, in this application. Claims 1-3, 5, and 7-9 are presented for examination. Claims 4 and 6 have been cancelled without prejudice, and the subject matter of these claims has been incorporated into amended independent claim 1. Claim 1 has been amended to more distinctly claim that which the Applicant regards as his invention. Claims 7 and 8 have been amended to depend solely from claim 1. No new matter has been added. Individual issues raised in the Office Action are addressed next.

### *Claim Rejections Under 35 U.S.C. § 102(b)*

Claims 1-3 and 5 were rejected under 35 U.S.C. § 102(b) as anticipated by a technical journal article by Vander Wal entitled “Fe-Catalyzed Single-Walled Carbon Nanotube Synthesis Within a Flame Environment” (Combustion and Flame 130:37-47 (2002)). Applicant respectfully disagrees.

It is well settled that “[a] claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference.” *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). “The identical invention must be shown in as complete detail as is contained in ... [the] claim.” Manual of Patent Examining Procedure (MPEP) § 2131 (8<sup>th</sup> ed., October 2005); and *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989).

According to the apparatus for synthesizing a carbon nano-material, as defined in amended Claim 1, while the reaction gas and the metallic catalyst pass through the tubular reactor, the carbon nano-material is synthesized inside the tubular reactor. The heating means is positioned outside the reactor and heats the reactor to a temperature proper for the synthesis of the carbon nano-material. That is, the carbon nano-material is synthesized inside the tubular reactor in an indirect heating environment. Further, since the reflector is positioned opposite the heating means about the reactor, the quantity of heat transfer to the reactor is increased. As such, since the carbon nano-material is synthesized inside the tubular reactor in the indirect heating environment, the carbon nano-material can be produced with high purity and without any impurities.

By contrast, the experimental apparatus described in Vander Wal does not include the tubular reactor. Instead, the experimental apparatus described in Vander Wal employs a mechanism in which carbon nanotubes are synthesized within a flame by direct heating thereby. That is, in the experimental apparatus described in Vander Wal, the carbon nanotubes are synthesized in a direct heating environment using the flame. In such a case where the carbon nanotubes are synthesized within the flame, since impurities such as solid particles, etc. are synthesized together, the experimental apparatus is disadvantageous in that the carbon nanotubes cannot be produced with high purity and without any impurities. Further, the experimental apparatus described in Vander Wal does not teach or suggest the movable heating means and the reflector positioned opposite to the heating means about the tubular reactor.

Because Vander Wal does not teach or disclose each and every element of the apparatus for synthesizing a carbon nano-material, as defined in amended claim 1, Vander Wal cannot anticipate claim 1. Therefore, the rejection of claim 1 under 35 U.S.C. § 102(b) should be withdrawn. Because claims 3 and 5 are dependent claims depending from claim 1, the rejections under 35 U.S.C. § 102(b) of these claims should also be withdrawn, for at least this reason.

#### ***Claim Rejections Under 35 U.S.C. § 103(a)***

Claim 4 was rejected under 35 U.S.C. § 103(a) as obvious over Vander Wal in view of Adderton (U.S. Pub. 2004/0037767). Claim 6 was rejected under 35 U.S.C. § 103(a) as obvious over Vander Wal in view of Chen (U.S. Pub. 2005/0109280). Claims 7 and 8 were rejected under 35 U.S.C. § 103(a) as obvious over Vander Wal in view of a technical journal paper by Hahn et al., entitled "New continuous gas-phase synthesis of high purity carbon nanotubes by a thermal plasma jet," (Carbon 42 (2004) 877-883). Claim 9 was rejected under 35 U.S.C. § 103(a) as obvious over Vander Wal in view of Wintermute (U.S. 2,698,669) and Kudas (U.S. Pub. 2004/0072683). Applicant respectfully disagrees with these rejections.

In *KSR International Co. v. Teleflex Inc.*, the U.S. Supreme Court rejected the Federal Circuit's *rigid application* of the "teaching, suggestion, motivation" test ("the TSM test") in determining obviousness in the particular case in question. 127 S.Ct. 1727, 82 U.S.P.Q.2d 1385, 1395 (2007) (emphasis added). According to the Supreme Court, the correct analysis is set forth in *Graham v. John Deere Co. of Kansas City*, 383 U.S. 1 (1966). *Id.* However,

the *KSR* decision indicated that while the TSM test is not the sole method for determining obviousness, it may still be used and in some cases is helpful. *Id.* at 1396. (“When it first established [the TSM test], the Court...captured a helpful insight.”). Indeed, the guidelines for the examination of patents in the wake of the *KSR* decision make clear that an Examiner may still apply the TSM test, after resolution of the *Graham* analysis. *See Examination Guidelines for Determining Obviousness Under 35 U.S.C. 103 in View of the Supreme Court Decision in KSR International Co. v. Teleflex Inc.*, 72 Fed. Reg. 57526, 57528 (Oct. 10, 2007) (“USPTO Guidelines”).

The *Graham* factual inquiries are: (1) determine the scope and contents of the prior art; (2) ascertain the differences between the prior art and the claims at issue; (3) resolve the level of ordinary skill in the pertinent art; and (4) evaluate any evidence of secondary considerations. *KSR*, 82 U.S.P.Q.2d at 1395 (*citing Graham*, 383 U.S. at 15-17). Once the *Graham* factors have been addressed, the Examiner may apply the TSM test, asking whether (1) a teaching, suggestion or motivation exists in the prior art to combine the references cited, and (2) one skilled in the art would have a reasonable expectation of success. *See USPTO Guidelines* at 57534.

The *Graham* factual inquiries begin with an analysis of the scope and content of the prior art, in view of the scope of the claimed invention. *See USPTO Guidelines* at 57527 (*citing Phillips v. AWH Corp.*, 415 F.3d 1303, 1316 (Fed. Cir. 2005)).

Claim 4 has been cancelled, and its subject matter incorporated into claim 1 which, as described above, is patentable. The rejection of claim 4 is therefore moot and should be withdrawn.

Claim 6 has been cancelled, and its subject matter incorporated into claim 1 which, as described above, is patentable. The rejection of claim 6 is therefore moot and should be withdrawn. Further, the secondary reference Chen is not prior art to the present application, as it was filed after the present application’s priority date of April 12, 2003. As shown in the attached verified English translation of the Korean application, the priority document discloses the instantly claimed subject matter. *See, e.g.* page 8 of the English translation and Figs. 2 and 3. Therefore, this application is entitled to the filing date of April 12, 2003. Chen was filed on September 21, 2004, claiming priority to a U.S. provisional filed on September 22, 2003. Thus, Chen is *not* prior art to this application. Because Chen is not prior art, the rejection based on Chen must be withdrawn.

Regarding claims 7 and 8, the secondary reference Hahn is not prior art to the present application, as it was published after the present application's priority date of April 12, 2003 (see attached verified translation of foreign priority document). The Korean priority application discloses the instantly claimed subject matter. *See, e.g.*, Figs. 2, 3, and 4 and pages 7 and 10 of the English translation. Therefore, this application is entitled to the filing date of April 12, 2003. The publication date of Hahn is no earlier than March 5, 2004, the date it was "available online." However, even the earliest date mentioned in Hahn, the date it was "received" by the publisher (December 5, 2003) is later than the priority date of the instant application. Therefore, Hahn is *not* prior art to the instant application, and the rejection based on Hahn must be withdrawn.

Also, because the primary reference (Vander Wal) does not teach, disclose, or suggest the forms of reactors recited in claims 7 and 8, and in fact teaches away from the claimed invention by teaching forming nanotubes in an open flame rather than in any sort of reactor, claims 7 and 8 are not obvious over the cited references, and the respective rejections should be withdrawn. For the purpose of obviousness analysis, prior art that teaches away negates an obviousness rejection. "[A]n applicant may rebut a prima facie case of obviousness by showing that the prior art teaches away from the claimed invention *in any material respect*." *In re Peterson*, 315 F.3d 1325, 1331 (Fed. Cir. 2003). (Emphasis added.) Further, claims 7 and 8 are dependent claims depending from claim 1 which, as discussed above, is patentable. The rejections of these claims should therefore be withdrawn for the additional reason that they depend from a patentable base claim, incorporating thereby all its limitations.

Regarding claim 9, this claim is also a dependent claim depending from claim 1. The rejection of this claim should therefore also be withdrawn, for at least this reason.

### ***Conclusion***

In view of the above, applicants respectfully submit that the present application is in condition for allowance. A favorable disposition to that effect is respectfully requested.

A fee for a 3-month extension of time is believed to be due with this submission, per the Petition for Extension of Time filed herewith. Please charge any fee that may be due or credit any overpayment to Jones Day Deposit Account No. 50-3013.

Should the Examiner have any questions or comments concerning this submission, he is invited to call the undersigned at the phone number listed below.

Date: May 20, 2008

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Respectfully submitted,



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